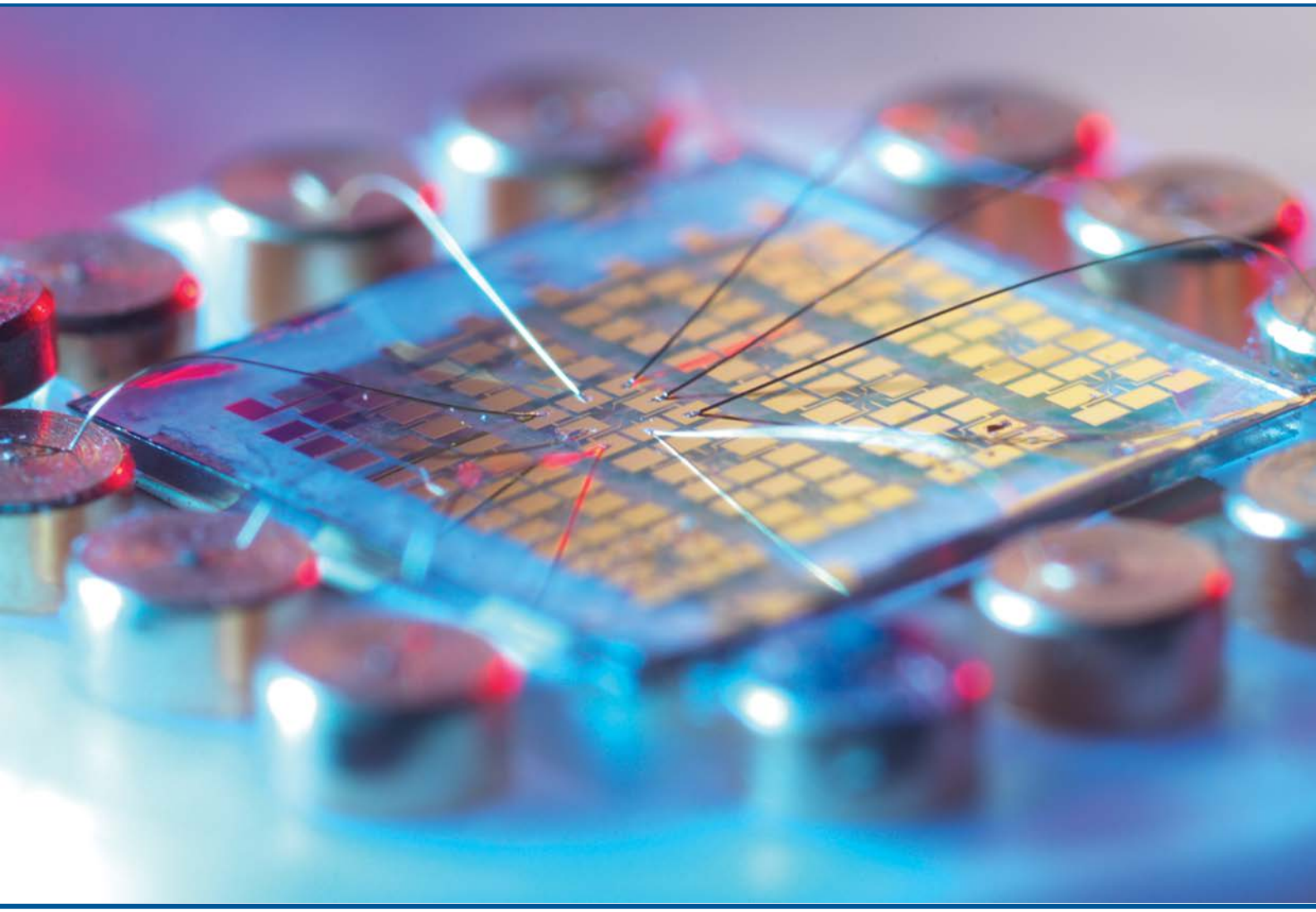
NPL
National Physical Laboratory

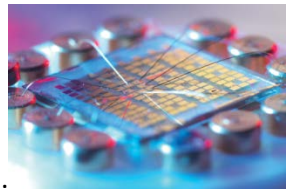


The National Physical Laboratory

Corporate Plan

2015 - 2019

Date: 25 February 2015



Light-modified graphene chips, like this one, are already being used in high-precision electrical experiments at NPL. By coating graphene with light-sensitive polymers, we can precisely control and exploit its electrical properties. In future, similar polymers could effectively translate information from their surroundings and influence how graphene behaves. This would allow them to work as reliable sensors for smoke, toxic gases or any other targeted molecules.

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Foreword

NPL is undergoing a momentous change. In November 2012 David Willetts, the then Minister for Universities and Science, announced that he wanted a different model to run NPL, once the current contract with Serco was completed. The Minister recognised NPL as a critical national asset and wished to build on the achievements under the Government-owned Contractor-operated arrangement. He envisaged NPL further strengthening its academic and business links through partnership between Government and academia. This vision is now close to reality and in July 2014 the Minister announced that NPL would become 100% Government (BIS)-owned Company with a strategic partnership between the Universities of Strathclyde and Surrey and the Department for Business, Innovations and Skills (BIS).

The new arrangement will begin in 2015 and offers many new opportunities, not least through being closer to Government, leading the development and implementation of the NMS strategy, and being more able to work with the Innovation Infrastructure and research communities to provide stronger support to address Government challenges. Examples include:

- The potential to grow NPL's regional impact by establishing hubs in Scotland and Cambridge that build on our current hub at Huddersfield.
- Opportunities for new Joint Research Centres that play to both NPL's and our partners' science strengths and the ability to translate this science into "real-world" applications that offer real economic benefit for example the Quantum Metrology Institute, Global Sensing and Satellite Centre (GloSS), Centre for Metrology in Health Care, and Institute for Pharmaceutical Imaging.
- Broadening NPL's work in training to work more closely with academia to produce "industry-ready" graduates and postgraduates. NPL already has ~100 postgraduate and postdoctoral students working with us and will increase to 150 as a result of the NPL's support to the EPSRC Centres for Doctoral Training. Our ambition is then to add an additional 300 students through a new Postgraduate Institute centred at Teddington and our regional hubs.

However, although an exciting period of change, NPL's commitment is unchanged to delivering science with impact. It is also important at a period of transition to confirm the enduring values and principles that underpin NPL: we remain committed to sustaining NPL as one of the top three NMIs in the world; to operate with independence, impartiality and integrity; to deliver solutions for all our customers; and to work in partnership with Government, academia and industry to deliver the greatest benefit for the UK and the world.

Finally, with the change, I am also planning to retire from NPL in June 2015 and recruitment of my successor is under way. I am particularly grateful to the NPLML Board and my Executive colleagues, the Leadership team and the Science Fellows for all their work and unstinting support; NPL is well-placed to meet the exciting challenges that the new model offers.

Brian Bowsher, Managing Director

The 2014 NPLML Board - Ian Downie, Nicola Anson, Richard Brook, Martyn Sené, Sir Peter Williams and Brian Bowsher

"NPL is a world-class centre of excellence in developing and applying measurement standards and its work with business and industry is well-established. As a leading international technological university, Strathclyde is perfectly positioned to help grow both the scientific and commercial engagement activity of this globally recognised Institute. Together, we will invest our joint expertise to significantly increase engagement across UK business and industry, raise our international research profile and deepen collaboration with the UK science base. The alliance underlines our commitment to the development of 'gold standard' postgraduate training which will develop the metrology experts of tomorrow."

Professor Sir Jim McDonald, Strathclyde's Principal and Vice-Chancellor

"This strategic partnership will draw on the partners' combined expertise to deliver the Minister's vision for NPL. NPL's focus on scientific excellence and industrial impact perfectly complements Surrey's world-class research in the key areas of electronics, communications, physics, health, medicine, and space science. By expanding the partnership's research community and capabilities we are confident that the effects will not only be felt by industry across the UK, but also internationally."

Professor Sir Christopher Snowden, Vice-Chancellor for the University of Surrey

NPL – A new chapter

NPL is undergoing exciting changes. 2015 will see us building upon our successes, both scientifically and in developing economic and social impact, to work in a new long-term partnership. The strategic partnership between the Department for Business, Innovations and Skills (BIS), the Universities of Strathclyde and Surrey, and NPL will bring together our track record of working with industry and our complementary academic strengths. Final arrangements are currently being developed with the aim to launch the partnership in 2015.

The partnership will enable all parties to strengthen both the excellence of their science and their engagement with business. The Universities of Strathclyde and Surrey are leading higher education institutions whose work has an impact on society and the global economy through pioneering research in priority sectors. They share an enterprising spirit and a strong track record of working with industry, achieved by removing barriers between scientific discoveries and commercial applications. Both are well-positioned to have a major impact on the future success and growth of NPL.

This change, whilst exciting, will not affect our support to our customers and stakeholders. We remain committed to being one of the top three National Measurement Institutes (NMIs) in the world and delivering economic impact to the UK by providing solutions to all customers. The independence, integrity and impartiality of NPL will be as important as ever in our delivery of measurement science that makes a real difference to the UK's prosperity and quality of life.

NPL as a Government Company (GovCo)

NPL, as the UK's NMI, is an essential part of the Government infrastructure providing scientific advice to underpin policy and establishing new standards. NPL supports policy across Government including BIS (National Measurement System), DECC (Climate change), Defra (Air quality monitoring), Home Office (Biometrics) and DH (Radiotherapy standards).

Since 1995, NPL has been run under a Government-owned Contractor-operated (GOCO) model with Serco as the contractor. From 1 January 2015 this model changed and NPL became a 100% Government-owned Company (GovCo). NPL will engage with BIS and the two Universities in a Strategic Partnership in order to enhance NPL and the Teddington site as a valuable science and technology asset.

Shares in NPL Management Limited (NPLML) have transferred from Serco to BIS. BIS recognises that the commercial nature of the business is essential to meet its existing and future requirements. NPL expects to retain the operational freedoms needed to enable it to continue to deliver its mission with commercial discipline and to respond rapidly and flexibly to its customers.

NPL will continue its principal role as the UK NMI and will develop its role to play a greater part in the national infrastructure by developing the UK Measurement Strategy and Programmes, as well as continuing to grow its competitively-won work to lever Government funding and create economic and social impact for the UK. In addition, NPL will also take on the responsibility for running the estate for the Teddington campus.

The NPLML board will be chaired by an independent Non-Executive Director and include Non-Executive Directors from the university partners as well as externals. BIS, as owner, will nominate a shareholder director on the new board.

NPLML Governance – New Science and Technology Advisory Council

A new Science and Technology Advisory Council (STAC) will be established to provide independent strategic advice, challenge and support to the NPLML board, particularly on the quality, international standing and industrial relevance of NPL's science and technology. It will also advise on the development of the UK Measurement Strategy. It is also hoped that the members of the STAC will act as influential ambassadors for NPL and measurement in their respective sectors. The STAC's members will bring authoritative, independent perspectives to bear in assessing and challenging NPL's work. The STAC will provide advice and challenge on the science and technology which NPL delivers as part of its mission. This includes delivery of:

- National Measurement System (NMS) Science Programmes, Technology R&D for grant awarding bodies and commercial customers
- Measurement Services
- Internally-funded Strategic Research

As part of its remit to assess NPL's science and technology, the STAC would be expected to commission appropriate independent reviews, notably to assess the quality of NPL's work against international benchmarks on a three to four yearly cycle. Membership will include key figures from Industry, Government and academia both from UK and internationally.

National Measurement System Governance and Management

The National Measurement System (NMS) is the technical and organisational infrastructure that ensures a consistent and internationally recognised basis for measurement in the UK. NPL, as the National Measurement Institute, delivers the majority of the publicly-funded NMS science programmes along with five other Designated Institutions (LGC Ltd, NEL TUV SUD Limited, National Gear Metrology Laboratory, National Institute for Biological Standards and Control, and National Measurement Office).

BIS will make NPL responsible for the UK Measurement Strategy that will define the Government's approach to meeting the UK's measurement needs and will aim to align the measurement related activities of NPL, the Designated Institutes, Innovate UK and the Research Councils, with the Government Science & Innovation and Industrial Strategies. The UK Measurement Strategy will be delivered principally through BIS-funded measurement programmes which will themselves be delivered by NPL and the Designated Institutes.

The principles for the governance are simplicity, flexibility to enable more partnership delivery of the NMS, and an outcome-based approach that enhances the impact of the programme. BIS will assure itself that NPL is delivering the UK Measurement Strategy effectively through a customer function within BIS.

Major Initiatives

The overall objectives, as set out by the Minister, for the Strategic Partnership, are:

- To strengthen the laboratory's science by engaging more with academia
- To make better use of existing facilities
- To encourage greater interaction with business
- To make better use of the Teddington site

NPL is exploring the following opportunities with the new partners that will enhance NPL's national and international footprint and impact for the UK:

Postgraduate Institute (PGI): The PGI will be the premier UK centre for doctoral training in metrology and its applications, focused on the physical, engineering, biological and chemical sciences with a core activity on the Teddington campus. It will build a new cohort of measurement experts that are urgently required in academia and business to ensure the UK's place at the forefront of technological advancements.

Joint Research Centres: These aim to build on collaborative research between business, academia and NPL to create Centres of Excellence that address long-term requirements for industry and developing new technologies. These include the potential for new research programmes and/or in some cases new facilities accessible to academia and industry.

Regional expansion in Huddersfield, Glasgow and Cambridge: NPL has successfully established a regional presence at the University of Huddersfield which is servicing a number of local customers directly, both large and small. Building on this, we plan to expand these activities beyond dimensional measurement and also establish new presences close to other industrial and academic clusters. Through this mechanism NPL will establish local access points to the breadth and depth of capabilities it offers in Teddington and an opportunity for collaborations to foster. Each of these regional sites may also host students from the PGI and/or a Joint Research Centre as appropriate.

Centres of Excellence and Joint Research Centres*
Established:

- Centre for Carbon Measurement (est. 2012)
- National Centre of Excellence – Mass Spectrometry Imaging (est. 2013) (Nottingham)
- Quantum Metrology Institute (est. 2014)

In development:

- Smart grids Metrology Centre (Strathclyde)
- Centre for metrology in healthcare (Surrey)
- Global Sensing and Satellite Centre (Surrey)
- Institute for Pharmaceutical Imaging (Nottingham)

*All of the Centres will have a wide number of business and academic collaborators.

Building upon 2014 – NPL's Corporate Plan 2015

Recognising the above opportunities, we have developed the current corporate plan to reflect an organisation in transition. The launch of the Strategic Partnership will enable embryonic activities to come to fruition and detailed plans to be put in place to deliver our ambitious vision for a transformed NPL. We expect 2015 to be both a year of new activities and a year of detailed planning for the future.

We are committed to developing the partnering arrangements and the culture to achieve optimum benefit to all parties, putting the NPLML Board and governance regime in place, and continuing to develop more strategic partnerships with academia and industry.

However, alongside these significant changes, we remain committed to the challenging goals that we set ourselves in 2014. In a period of change and challenge being clear on our priorities is vitally important and these are outlined below.

Priorities for 2015 – Deliver the Corporate Plan and Build for the Future

In delivering the 2015 – 2019 we will sustain NPL's strategy that has excellent science at its heart, grow our national and international reputation, deliver the greatest economic and societal impact, and grow and sustain our business. Specific additional priorities include:

- Introduce the new NMS governance regime and deliver the science strategy (see *Excellent Science* and *Impact*)
- Launch NPL Scotland (see *Impact*)
- Establish the PGI (see *Impact*)
- Develop the newly established Quantum Metrology Institute (see *Excellent Science*)
- Develop the Global Sensing and Satellite Centre (see *Growing Business*)
- Deliver new businesses including NPL*Time®*, PVP and Training; review licensing arrangements and IP management (see *Growing Business*)
- Enhance scientific collaboration within the Partnership and prioritise the business cases for Joint Researches Centres (see *Excellent Science*)
- Grow international reputation and impact (including effective delivery of EMPIR, growth of international business and exploitation of partner links) (see *International Status and influence*)
- Review infrastructure, estates and management information strategies to identify core investment requirements (see *Operations* and *Estates and Infrastructure*)

Our Role

Measurement is the frequently invisible currency exchanged in just about every economic or social activity. Confidence and consistency in this currency is critical for trade, manufacturing, for understanding our environment and can mean the difference between life and death as in the delivery of radiation dose for radiotherapy. This confidence and consistency relies on the scientific and technical infrastructure of the National Measurement System with NPL at the centre. NPL , as the National Measurement Institute is charged with:

- developing and disseminating the UK's measurement standards;
- ensuring that they are internationally accepted;
- conducting multidisciplinary R&D;
- delivering impact through technical services for the public and private sectors;
- and providing knowledge transfer and advice between industry, Government and academia.

NPL therefore fulfils a critical role in the innovation infrastructure by providing measurement knowledge and delivering the policy objectives set out in recent government strategies such as the Science and Innovation Strategy, Industrial Strategy and the Eight Great Technologies.

The work under the National Measurement System delivers high quality science capabilities that are cascaded to industry end users either directly or through the calibration chain. Leading the scientific metrological development maintains our position as top 3 NMI. Therefore leveraging public funding through grants and commercial income substantiates the economic impact by enhancing our capabilities and providing a direct route to market.

Mission

To provide the measurement capability that underpins the UK's prosperity and quality of life.

We will advance the UK scientific and technical foundation for standards that enable equitable trade, support innovation and deliver both economic and quality of life impact for the UK. Our mission stands apart from, and complements, academic and industrial organisations. It provides a substantial part of the UK's innovation infrastructure, delivering science and technology and addressing national needs. NPL is a world-leading NMI and delivers this mission through its core UK Measurement System work, competitively-won business, services and knowledge transfer.

Vision

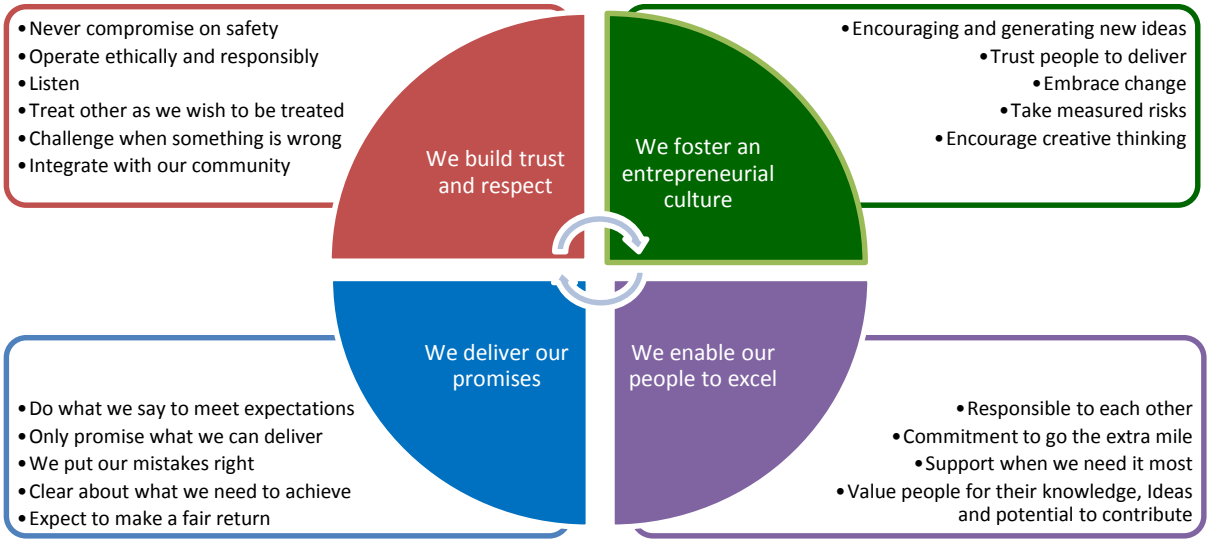
As a Science and Technology Laboratory driven by a national mission, we will:

- **Be recognised as a top three NMI in the world**
- **Be aligned and integrated with the UK innovation landscape to maximise the value of the government investment**
- **Deliver excellent science, accelerating economic growth and making a real difference to societal challenges**
- **Be the heart of a thriving 'Innovation Campus' at Teddington and deliver impact beyond this through increased activities across the UK**
- **Provide trusted scientific advice to Government to underpin policy**

With a world-class measurement capability at the core, NPL will expand geographically across the UK and engage strategically with core partners and customers, forming research and commercial partnerships that deliver a step-change in economic impact for the UK. To achieve this, NPL will grow significantly, have a strong footprint across the UK, and be seen nationally and internationally as an exemplar for training and developing scientists and engineers to meet the measurement needs of industry.

Values

We remain committed to our values which are aligned with the public mission of NPL; the need to develop creative and committed staff, who feel empowered to deliver the best science and service to stakeholders; and the creation of a work environment that people enjoy and in which they feel valued.



Strategy

NPL's strategy is simple - at our heart we deliver excellent and responsive science. This enables us to remain a world-leading NMI with international influence and to contribute to national and international priorities. Our aim is to be the national laboratory that delivers the greatest social and economic impact. We enhance our impact through applying our research and knowledge to our work with Government and industry and through commercial services. As a result we can continue to be a growing and sustainable business through the services we offer to Government and industry.

Our four interdependent strategic objectives position NPL to deliver our mission and our vision.

1. Continue to deliver excellent responsive science and knowledge services.

Excellent science is essential to maintain our leadership in our chosen disciplines and acts as the crucial foundation of NPL. This will be achieved by building critical mass and rebalancing core science capabilities, maintaining breadth through partnership, attracting star researchers and providing an attractive environment for world-class scientists. Excellent responsive science drives national and international reputation and delivers impact.

2. Retain international status and influence: a world-leading NMI.

Our ability to influence the international Science and Technology infrastructure in metrology depends on our leadership status. Remaining a top 3 NMI is critical for this. We will maintain NPL's leadership within the international measurement community by being at the forefront of developing new measurement strategies, technologies and standards while also representing UK interests. We serve as a source of independent technical and metrology advice to Government and industry. These roles require sustained, integrated capability and are particular to NPL's status as a National Measurement Institute.

3. Remain the NMI that best demonstrates social and economic impact.

Through our many partnerships with business and academia, we will be recognised for delivering the highest economic and social value, underpinning our credibility as the international leader. Effective knowledge transfer will ensure NPL delivers maximum economic and social impact to the end users.

4. Sustain organic growth and develop step-change initiatives to deliver a growing and sustainable business.

We will make our capabilities commercially accessible to end users, which will diversify our funding, maximise our impact and enable us to be a financially-sustainable growing business.

We will deliver our strategy through activities and aspirations focused on the four strategic objectives and three additional underpinning areas: people, infrastructure and operations. We will ensure sustainability and growth of the organisation through balanced prioritisation of investment.

Focus	2014 Key Achievements	Five Year Aspiration
Science	New Science Strategy has been developed and all science areas reviewed	To have a world-leading reputation in our chosen science fields with 100% science areas internationally leading or competitive as audited by external benchmarking
International	NPL's Research and International Director played a pivotal role in securing €600M for the European Metrology Innovations and Research Programme through Horizon 2020 and NPL won the contract to manage the programme	Remain a top three NMI with representation in the highest CIPM committee memberships and leadership of EMPIR
Impact	Increased our customer base by 70% in Huddersfield and training customers globally by 25% all contributing to increased impact; successfully launched ETV and e-Learning, two new tools to expand our reach into new user groups	Measured by external review - helping the UK organisations achieve £1B pa of financial benefits, leverage NMS investment threefold across NPL through increased collaboration and NPL's regional footprint and strategic partnerships increased
Growing Business	NPL won a contract worth up to £4.4M to be a key providers for the ambitious Sharing in Growth programme delivering Product verification support; NPL*Time*® was launched with two distributors secured. Our low carbon technology related work grew by 70%.	To become a £120M business including a portfolio of business activities delivering £68M non-NMS revenue, and an optimal Key Account Management programme
People	NPL staff survey had an 82% return and 54% engagement score (an increase of 11% on previous surveys) and MyView - a staff self-help system - was launched	Additional 200 full-time equivalent staff working at NPL including an increase in guest workers, a community of FRS and FREng members and high staff engagement demonstrated by external review
Operations	We secured over two million working hours without a reportable incident and Project Management Offices were established in each of the Science Divisions	To have the systems and processes in place to deliver effectively, as measured by customer satisfaction, staff utilisation and staff survey
Infrastructure and Estates	Work on the new Advanced Quantum Metrology Laboratory began and the new DIAL mobile laboratory was launched	An additional £40M investment to the site, with a world-leading Advanced Quantum Metrology Laboratory operational and new staff accommodated within the current infrastructure

Excellent Science

Excellent science is at the heart of NPL, enabling the laboratory to grow its national and international influence, deliver real and demonstrable impact on the economy and quality of life, and support the growth of a sustainable business.

NPL's science strategy recognises the unique mission and premier status of the laboratory as a stable reference point for SI traceability and calibrations, for the provision of new measurements and for the development of a globally acceptable and standardised measurement framework. These activities underpin UK trade and industry, accelerate innovation and make a substantial contribution to GDP and the UK regulatory structure. NPL is a leading national laboratory with the integrity, independence and impartiality required for measurement and standards.

NPL maintains a portfolio of science covering both breadth and depth in areas. To maintain our scientific aspirations we deliver a broad range of world-class capability and, in chosen areas, have invested in critical mass of capability and partnerships to maintain our world-leading NMI reputation.

Our Science strategy is divided into linked operational aspects and broad research priority themes for the future.

Operational aspects:

- Deliver NPL's core mission as a premier NMI.
- Sustain three basic activity strands fundamental to our mission - core NMI functions, national challenge directed research; long-range exploratory and capability building research.
- Maintain an emphasis on excellent science as the core of NPL's activities.
- Attract and develop staff at all career levels and ensure that staffing policy is consistent with the need for NPL to have a skill mix that is enduring as well as flexible.
- Seek expert input, advice and advocacy from the highest calibre persons from academia, Government and industry.
- Establish Joint University/Industry/RTO Partnerships.

Our vision is that metrology will develop in the 2020s within a framework, defined by the four themes below:

- The new quantum SI - as a result of a new quantum SI, several of the base units of measurement will be

Collaboration with Penn State University, USA has resulted in a model to evaluate the long term uncertainty of NPL's Caesium Fountain, reducing this uncertainty to 2.0×10^{-16}. This uncertainty is equivalent to the clock losing or gaining one second in 158 million years.

59% of NPL's projects are collaborative compared with 39% of EPSRC projects. NPL is also the EPSRC's 6th most prolific industrial collaborator, below Rolls-Royce, GSK, Dstl, BAE Systems and Jaguar Land Rover.

NPL with PTB in Germany have been able to improve the constraints on time-variation of fundamental constants by making measurements of two optical clock transitions in the same atom, ytterbium. NPL is developing optical atomic clocks using a number of different atoms and ions, one of which is the ytterbium ion.

significantly revised and redefined to remove the remaining physical artefacts and take advantage of advances in quantum metrology.

- Measurement at the frontiers - advances in science and technology push at the frontiers of what is possible for metrology requiring new capabilities to make measurements that are beyond the boundaries of today.
- Smart and interconnected measurement - large-scale, multi-measurement systems will exploit the availability of networked information and make use of the 'internet of things', in which physical objects integrate seamlessly into the global information network providing metrological challenges in the fusion, modelling, traceability and uncertainty of data.
- Embedded and ubiquitous measurement - metrology capability will need to be embedded at the heart of products and systems, 'always on' and 'always calibrated' in real time, in an example of technological convergence (the trend for technology-driven systems to evolve to perform similar tasks).

NPL works in 23 Science Areas:

Advanced Engineered Materials
Biotechnology
Data Analysis and Uncertainty Evaluation
Dimensional Metrology
Earth Observation, Climate and Optical Radiation Metrology
Electrochemistry
Electromagnetic Applications
Electromagnetic Communications Metrology
Environmental Measurements
Functional Materials
Gas and Particle Metrology
Mass and Related Quantities
Materials Performance and Processing
Materials Modelling
Neutron Metrology
Quantum Detection
Radiation Dosimetry
Radioactivity
Sound in Air and Water
Surface and Nanoanalysis
Temperature and Humidity
Time and Frequency Metrology
Ultrasonics

NPL has set out its future vision in *Metrology in the 2020s.* This has significant implications for the way a world-leading NMI will operate. The historic paradigm of providing primary standards and calibration services to disseminate these standards will remain but reduce in importance. Measurement challenges will require multidisciplinary teams to address them. We will need to be working "on the ground" as much as "in the lab" delivering confidence in measurement through partnerships with a wide range of organisations. We will need to be able to apply metrological thinking in new domains and communicate with sectors and communities very different from those we have historically worked with. These new ways of working are already being woven into our science programmes and the way we operate.

The focus for delivering this strategy remains in four areas:

Joint Research Centres – NPL maintains a wide range of world-class science to deliver its mission. We have also identified priority areas where NPL has responded to scientific, Government and industrial challenge. The objective is to work in partnership with business and academia developing joint research programmes and shared facilities. We are actively working with our Strategic Partners, the Universities of Strathclyde and Surrey, to identify and deliver a number of joint research collaborations.

Building Reputation and Investment - The laboratory's credibility to operate is derived directly from its international reputation and competitive position as a centre for world-class science leading to innovation in measurement and standards. Whilst it remains our intention to grow all 23 Science Areas, we have identified a number of areas in which significant additional investment will be made to continue to build a critical mass of capability, partnerships and reputation which enable us to be a world-leading NMI. Our scientific reputation is reviewed through a range of esteem factors annually and the newly formed Science and Technology Advisory Council will play a key role in monitoring this.

Enhancing our science through Joint Research Centres includes the development of:

i) 'The Quantum Metrology Institute' which aims to build a unique collaboration between NPL, university and industry partners to accelerate the commercialisation of new products based on Quantum Technologies from both existing and future platform technologies.

ii) 'The National Centre of Excellence in Mass Spectrometry Imaging (NiCE-MSI)' which aims to build upon NPL's world-leading presence in this exciting field of science to deliver earlier adoption, implementation and impact primarily in the health sector.

Both are examples where we, together with our collaborators from academia and business, aim to build centres of excellence with critical mass that advance our scientific understanding and be the springboard for future discoveries.

Working in Partnership – NPL's research benefits from access to increased expertise and intellectual flexibility that such contact creates, leveraging the capability of the wider UK research base. We will continue to form strategic alliances with university collaborators and seek to expand the population of joint appointments and secondees increasing the both the quality and volume of 'NPL science'. We will work with our partners to establish the PGI at the Teddington site and our regional centres.

Leading the SI –As the UK's NMI NPL realises, maintains, develops and disseminates the base units of the SI. NPL not only acts as a stable reference point for SI traceability and calibrations, but also plays a major international leadership role in developing the units further. Whilst NPL maintains and disseminates all the SI units BIS and NPL have chosen to focus upon supporting temperature, time and electrical unit redefinition.

> *"There has been a MoU in place between Imperial College London and NPL since October 2008. This has given benefits to both parties in increasing the range and effectiveness of a number of our research programmes, in for example quantum optics, solid state physics and plastic electronics. The College's strategic priorities include collaboration and partnership with world class institutions and we look forward to exploring further such opportunities with NPL."*
>
> Professor Donal Bradley, Pro-Rector (Research) Imperial College London

> *"The University sees great mutual benefit in working closely with NPL. We are looking forward immensely to developing a close working relationship with the laboratory. Similarly we hope to develop other strategic partnerships with key industry partners, who match the University's ambition and pursuit of excellence."*
>
> Professor Yellowlees, Vice-Principal and Head of College of Science and Engineering at the University of Edinburgh

Action	2014 Achievements	2015 Plans	Five Year Aspiration
Joint Research Centres	Launched the Quantum Metrology Institute (QMI)	Pursue plans and cases for new centres (see box) and cement the delivery of the newly formed QMI	To jointly manage and contribute to Joint Research Centres in at least five of our chosen science fields
Reputation	A refreshed NPL Science Strategy has been developed; we have reviewed all science areas; and continued the growth in peer review publications. 67% were published in top-quartile journals when ranked by impact-factor	Implement recommendations from the NPL science review with targeted investment (see box) including recruiting stars in a number of areas Work with STAC to implement an international independent benchmark review that builds on 2011/12 exercise	To have a reputation through external benchmarking, worthy as a world-leading science organisation where all our science areas are competitive or leading in the world and representative of a top three NMI
Partnership	Working with 23 Centres for Doctoral Training, continued to increase the number of guest workers, students and joint appointments; 59% of NPL projects are delivered in partnership; and 75% of peer reviewed papers were co-authored	Develop a Customer Key Account approach to our science partnerships, as a first step in creating a PGI on the site, we are looking to professionalise our cohort experience for postgraduate students	To build an integrated approach to and work in partnership with the key world-leading organisations and people in our chosen science areas
Leading SI	NPL was awarded the Duke of Edinburgh Navigation Award for its long term atomic clock development. Adding to its historic successes, NPL recently achieved accuracies in time measurement of 1 second in 158 million years, which has provided greater evidence that fundamental constants remain constant over time	Aim to close the metrological triangle informing the redefinition of the kilogram and ampere, measure errors in the current temperature scale and focus upon candidates for redefinition of the second	To maintain our top three NMI position and be key in the redefinition of the units for temperature, time and electricity

International Status and Influence

NPL is part of a worldwide network of NMIs with global influence. We have a key role in international agreements with equivalent NMIs abroad, making the UK a significant player in developing international measurement standards while also representing UK interests. We also contribute to the Mutual Recognition Arrangements whereby institutes worldwide recognise the validity of each other's calibration and measurement certificates.

With our new Strategic Partners, there is a great opportunity to establish a network of international academic collaborators linking metrology research in academia with the NMIs. Through the use of student mobility funding and building on existing collaborations internationally we aim to build more scientific engagement for the benefit of metrology research worldwide. The wider partnerships also provide opportunities for international business development through facilitated access and new collaborations.

Our international strategy aims to sustain NPL as a top three NMI worldwide and we have four action areas to ensure we maintain this:

International Reputation: A rigorous focus on quality in everything that we do; continue to provide leadership within the EU and beyond through development of future metrology strategy, and smart investment of our resources to ensure maximum impact in light of considerably lower Government funding than international counterparts.

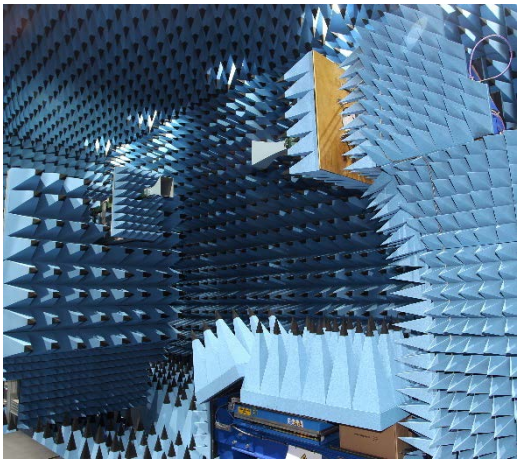
International Relationships: Closer connections with strategic institutional partners beyond our EURAMET partners, such as NIST USA, NIM China, NPL India, KRISS Korea, NMIJ Japan and AGNMI Australia, as well as engaging with developing NMIs to support the establishment of a sound measurement infrastructure in their countries.

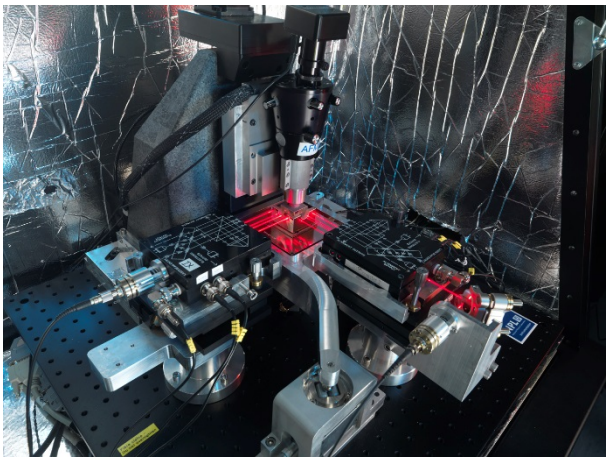
European Metrology: Focus on delivering excellent value for money and impact with the new European Metrology Programme for Innovation Research (EMPIR); position the programme for future funding and provide leadership in particular through our work within EURAMET; and use it strategically to enhance our strength and capability.

Influencing for the UK: As the UK's NMI, ensure that UK interests are represented globally, in particular through the leadership and participation within all leading committees for international technology and standards. Analysis of British Standards shows that 61% of all standards contain measurement and testing, underscoring the importance of the National Measurement System to standardisation.

Kamal Hossain, Research and International Director at NPL and EURAMET Chairman, has led the negotiations with Metrology Authorities of 28 countries and the EC to deliver a second European Metrology programme with a 50% increase in funding compared with its predecessor programme. This has delivered €1 billion of metrology funding through both programmes. NPL has also secured the contract to deliver the management of the new programme.

The National Institute of Metrology (NIM) China is an important strategic partner for NPL. 2014 saw the successful delivery on time of a brand-new Antenna range facility built by NPL to NIM with exceptional efforts provided by NPL scientists. The facility is a showcase for academia and business and enhances NPL's reputation in China, whilst cementing the partnership between the two NMIs. Collaborations in research in several areas are being developed. International contracts make up 56% of our competitively-won revenue.





NPL has just completed a three-year project with the National Physical Laboratory India (India's NMI) to build, design and install a Metrological Atomic Force Microscope at their facility in New Delhi. The microscopy performed better than specification after installation providing India with a facility comparable with a world-leading NMI and enable NPLI to take part in international comparisons of AFM measurement.

"The International Committee for Weights and Measures (CIPM) has welcomed strong support from NPL in its Consultative Committees and other international activities to raise the profile of metrology (notably recently with work on carbon measurement and climate change). We have also welcomed NPL's constructive engagement with the International Bureau for Weights and Measures (BIPM) as we review the strategic direction of metrology and the balance between work conducted at BIPM and by the major National Measurement Institutes such as NPL. We look forward to continued strong interactions with NPL as we promote the International System (SI) of measurement with effective and consistent standards of measurement that will support international trade, commerce, health and the environment."

Dr Barry Inglis, President CIPM (Comité international des poids et mesures)

Action	2014 Achievements	2015 Plans	Five Year Aspiration
International Reputation	Acting smarter to keep top three status in face of fierce competition through expanding partnerships with NMIs and key contributions in CIPM, Consultative Committees, and standards	Ensure NPL readiness to provide leading contributions to the redefinition of at least three SI units.	To retain an independently reviewed reputation as a top three NMI; representation on all CIPM Consultative Committees and publish a new Metrology Vision
International Partnerships	Strengthened relationships with NIST, PTB, China and India with the delivery of key facilities such as the Antenna range (NIM) and the AFM (NPL India)	Develop a plan for building strong links with academic institutions and RTOs abroad and continue instrumentation sales building upon 2014 achievements	We are considered the NMI of choice to partner with because of our agility, innovativeness and approach to increasing relevance and impact
European Metrology	Involved in 89/119 projects in EMRP, secured approval of the next programme by the EU Parliament and the Council of Ministers , the contract for managing the Programme, and leading the transformation of EURAMET into a truly professional organisation	Establish the framework for the successful implementation of EMPIR and longer term sustainability of EC funding	Be recognised as the leader in our chosen metrology areas and our ability to develop a strategic approach to an integrated European Measurement infrastructure. An open and trusted partner for all countries
Influencing for the UK	Chair three EURAMET Technical Committees	Lead the development of the European Strategic Research Agenda	Representatives on UK, European and international Metrology and Standards Committees representing the UK national interest and Government focus; Joined up with UKAS and BSI for increasing UK influence in the Quality arena internationally

Impact

NPL is recognised as the leader in generating and delivering greater return on Government investment than any other NMI. Independent economists found that measurement research and development has a significant impact on growth, equivalent to around 2% of GDP.

In a recent survey, customers reported that we have helped them achieve financial benefits of £634M p.a. through measurement innovation activity. We are committed to increasing this to deliver £1B p.a. of customer-reported financial benefit.

Our approach to impact remains embedded in the formulation of our work as well as its delivery. We focus upon four areas:

Creating impact by productising our knowledge and sharing it as widely as possible – for this we manage a pipeline of products and mechanisms that allow us to communicate effectively and actively assess our impact processes and demonstrate the benefits.

Expanding and exploiting impact channels through NPL regional centres – our Huddersfield Laboratory has demonstrated that customers, especially SMEs, like to work with local companies. This also enables NPL to tailor products and deliver them directly into regional activities.

Measurement Skills for all – following the success of the NPL industrial training and renewed interest in measurement skills, we aim to provide a wide range of resources in different formats that reach academic, research and industrial communities. The establishment of the Postgraduate Institute with the Universities of Strathclyde and Surrey will be a major contributor to our skills theme. Accessible to all students from the UK and Internationally, it pushes metrology capabilities firmly into the postgraduate curriculum, a key enabler for our collaborations with industry.

NPL's Huddersfield Laboratory has been growing in support particularly for local companies, almost doubling the number of customers and jobs in the past 12 months and increasing income by almost 70%.

NPL Huddersfield customers

NPL aspires to lead metrology education and training for industry and academia; and build a business in excess of £2.5M by 2018. The current training portfolio of National Qualifications, Continuing Professional Development, bespoke training and e-Learning has grown by 25% in the past year with three course launched in 2014 attracting over 1000 learners a year - 93% of those adopting NPL Training have made improvements within their organisation and 86% of NPL customers rate the training as 'Excellent'.

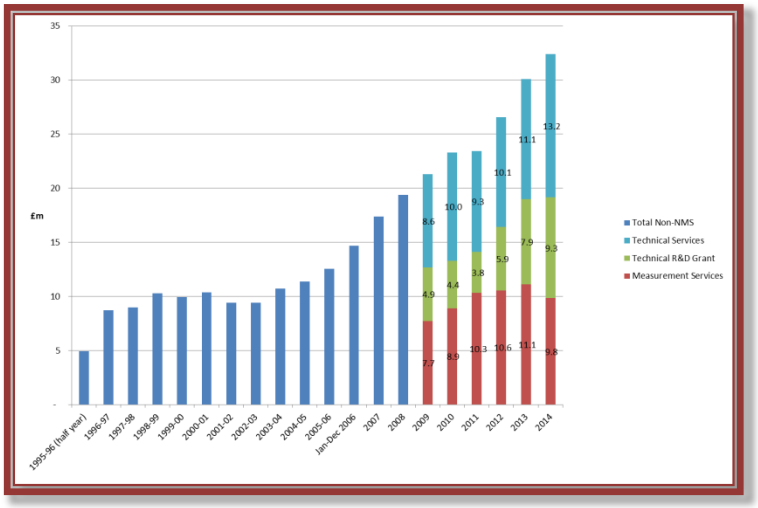
NMS programmes – NPL will ensure the delivery of the NMS strategy through our NMS Programmes, which is the largest component of our work, and therefore our impact.

Action	2014 Achievements	2015 Plans	Five Year Aspiration
Creating impact	Pipeline of ~80 products in place, with defined processes and manager; 'Launched' ~15 new products in 2014; increased our engagement with stakeholders; and are leading the impact assessment of the European Research Metrology programme. Our CCM is projected to save over 8M tonnes of emissions – equivalent to 2% of UK annual emissions	Repeating our major customer survey using new economic practices to position NPL for future spending reviews and develop a portfolio of impact for the European Metrology Research Programme	To manage a successful pipeline of impactful products that customers report as delivering £1B pa of financial benefit In response to BIS Evaluation Strategy 2015-16, we will also develop a counterfactual approach which uses control groups of companies as comparison
Measurement skills for all	A second cohort of apprentices employed; industrial training increased (see box). The launch of our online learning suite in 2014 saw already 1,000 learners benefiting from this new channel	Implement the Postgraduate Institute and launch an industry-led Apprenticeship Programme in Metrology for the advanced manufacturing sector	To develop and offer comprehensive skills programme including educational, apprentice, industrial and postgraduate training
Exploiting regional channels	NPL Huddersfield activities increased (see box) and significant planning in place for NPL Scotland	Launch NPL Scotland and put plans in place for a third regional site. Continue growth at Huddersfield and support regional Product Verification Programme delivery	A network of successful NPL regionally based activities delivering impact alongside selected partners focused upon regional economic clusters; measured through additional job creation, impact to customers and added value to local initiatives
NMS strategy	Successful trial of science programmes formulation process focusing upon top level outcomes and impact, new work in Quantum, material microstructure, 2-D materials (Graphene) and Electrochemistry defined as part of the new Strategic Capability Programme	Transition NPL to running the UK Measurement System on behalf of BIS with all the systems and processes, including implementing new formulation process to all NPL science programmes	To have surpassed the aspirations set out in the 2011-2015 NMS strategy demonstrated through science leadership, impact, an internationally leading reputation and developed the next strategy in partnership with BIS and Designated Institutes

Growing Business

The NMS investment at NPL provides measurement science and technology to deliver our core mission. From this we create a portfolio of capabilities to deliver economic and social impact. A significant and increasing fraction of this impact is delivered through products and services offered on a commercial basis. The growing income from this activity is also vital in spreading the fixed cost base and supplementing the NMS funding to build future capability, when prospects of NMS growth are uncertain. Measurement impacts on every one of the 11 sectors in the Government's industrial strategy and the '8 great technologies' identified by the Government for targeted investment.

Competitively-won revenue growth since 2004 has averaged 12% p.a. Our aspiration for the next five years is to continue to maintain strong overall competitively-won contracts growth and work towards delivering a £120M business, with over 50% delivered through the competitively-won business.



We continue to adopt both a market sector and key customer approach to our business development and look to capitalise on synergies with our new strategic partners, the Universities of Strathclyde and Surrey. Our knowledge of existing and emerging market requirements helps to direct our science programmes and aligns our products and services with the key national challenges defined in the NMS Strategy.

Apart from our core role for Government, NPL works with over 2,000 customers delivering a range of services, from calibration to joint research. Our customer satisfaction scores approach 90%, with many clients emphasising the technical quality and responsiveness. It will be a high priority to maintain this high level throughout the changes and is monitored closely by management.

The business development strategy continues to pursue the following four actions areas:

Organic Growth – to continue our track record for growth across our broad measurement capability and the full range of our existing product revenue streams.

Sector Focus – to continue to focus on our seven identified market sectors and for the business development and science teams to work together to align economic and social needs of these sectors with existing and emerging science capability, commercialising our science for products and services.

Key Accounts – to continue to embed the practice of Key Account Management into NPL, building trust with our most important customers through coordinated interactions and sharing their strategic vision for the future.

New Business – to identify and actively manage new opportunities that have the potential for single or recurring multi £M income, but may require investments or partnerships, or accelerating current business areas if appropriate. This category of opportunity has been included in our financial planning with an appropriate weighting to reflect the stage of development and risk/reward.

The **Centre for Carbon Measurement** brings together work across and NPL and its partners on climate science, low carbon technologies. In 2014, the value of this work reached €7.5m, with an annual revenue growth of 40% and sales growth of 70%. In addition, NPL has become the verification body for energy technologies under the European Environmental Technology Verification Scheme. NPL is also delivering work on emissions monitoring for industry and Government.

The **Global Sensing and Satellite** Centre of Excellence (GloSS), launching in 2014, is a unique teaming between NPL and University of Surrey to offer applied and responsive research enabling a new generation of trusted, globally available information services. The Centre of Excellence spans the entire value chain from acquisition to information, integrating data obtained from ground, air and space sensors to deliver value. GloSS will work with all types of organisations that face complex challenges across their business to support decision making by maximising the use of sensors, data and models. Acting as a single entity, GloSS will provide a clear interface between users, industry and the research community, working with its partners to deliver services and entire solutions that will improve safety, reduce risk, improve reliability and lifetime, and improve the quality of life.

Product Verification Process with Rolls-Royce - Product verification is a critical part of a manufacturing process, to ensure products are manufactured according to specification, thereby reducing or eliminating reducing product failure, poor performance, and waste and customer dissatisfaction. In 2014, NPL won a contract worth up to £4.4M to be a key provider for the ambitious Sharing in Growth (SiG) programme, part-funded by Government through the Regional Growth Fund, and supported by industry leaders including Rolls-Royce. NPL is now delivering within the Aerospace and Civil Nuclear sectors and we have further developed our business plan to extend delivery to other sectors. 25 health-checks have already been delivered in the aerospace and civil nuclear sector.

NPL*Time*® was launched in 2014, to provide a resilient, traceable and certified time signal, 'out of the wall', for the financial trading sector. Having traceability back to such a highly accurate time standard will ensure that transactions completed in microseconds can be easily certified by providing end-users with a trusted timestamp, regardless of how many locations the trades cross. NPL*Time*® currently has two contracted distributors provide the time on managed links to the client premises.

Action	2014 Achievements	2015 plans	Five Year aspiration
Growth	Achieved 10% growth in revenue and sales from established business development activities with our science divisions and from our chosen market sectors; >60% win rate from bids submitted	£36M competitively won revenue – through organic growth of existing market sector and additional business development for new sectors in Time and Frequency and Quantum Technology	Non-NMS Revenue – increased growth per annum to £68M also due to collaborative activities
Products	Measurement Services, Training, Instrumentation, Product Verification Programme, IPX – 37% of non – NMS revenue; and maintained a 88% customer satisfaction rate	>10% growth of product sales from new UK and International markets	Portfolio of established and new products with improved delivery and profitability.
Key Accounts	Key Account Management (KAM) process – the existing accounts, BP, Rolls-Royce and ESA and new accounts in 2014 GSK and Dstl achieved an overall 26% annual revenue growth	Maintain >25% revenue growth across the Key Account Portfolio; look to establish 'solution sales' to established key accounts	KAM optimised with a programme of continuous improvement, one account per market sector
New Business – 'Step Change'	Six Business Plans in place and delivering revenue, new plans for Quantum Institute and Regional Hub in development and nine new opportunities identified. Expanded the Centre for Carbon Measurement with annual revenue growth of 40%	Achieve forecast 2015 revenues from the business plans in execution; implement the Quantum Metrology Institute and Regional Hub plans, and develop two new plans for implementation	A portfolio of business activities delivering £M single or recurring revenues and a pipeline of future opportunities

People

NPL's reputation is built on great people and exceptional scientists. We place a high priority on attracting and developing staff at all career levels and will ensure that staffing policy is consistent with the need for NPL to have a skill mix that is balances enduring capability with the need for innovative thinking and engagement with science and business community that comes through shorter term appointments. Our judgement is that this could be achieved through a 70/30 split within the business of permanent versus fixed term contracts of employment. We want to develop a model that facilitates joint appointments between academia and NPL, enables more students to participate in NPL's research and creates more staff secondments, internally and externally.

We will expand our infrastructure to improve provisions for an increased population of students engaged in research on the Teddington site and at our regional hubs arising from the wider portfolio of academic interactions. These students will be integrated into the laboratory's operation as a distinct cohort for whom there will be bespoke training and dedicated programmes. The students will rapidly expand the profile of NPL and its activities following graduation in both academic and industry sectors.

The main aim of our people strategy is to ensure staff are empowered to deliver the best science and service to all our stakeholders; and to create a work environment that people enjoy and feel valued within. Our four key action areas are:

Staff engagement: to work towards a deeper understanding of what engagement means for NPL, thereby increasing commitment, loyalty and discretionary effort from staff with associated opportunities for reward and improvements in engagement scores.

Enabled workforce: to provide the right tools to make a positive difference to the employee and management experience of employment data.

Recruitment and managing talent: to attract and retain talent from variety of sources across a number of different employment models and through leadership development.

External recognition of staff and their work will be a key measure of success at NPL. We will celebrate NPL staff who receive external awards and are delighted to report the following in the past year:

Professor John Pethica, NPL's Chief Scientist was knighted in the Queen's Birthday Honours List 2014

Professor Patrick Gill and his team won the Council of the Royal Institute of Navigation, Duke of Edinburgh's Navigation Award for Technical Achievement in recognition of our long-term atomic clock development programme

Nick Ridler has been appointed a Visiting Professor in the School of Electronic and Electrical Engineering, Faculty of Engineering, at the University of Leeds and was presented with an IEEE Fellowship award at the IEEE International Microwave Symposium

Professor Graham Machin has been appointed to the Engineering and Physical Sciences Research Council (EPSRC) Physical Sciences Strategic Advisory team and elected Chair of the EURAMET Technical Committee of Thermometry

NPL supported five secondments at the Department for Business, Innovation and Skills (BIS) in 2014, including making the econometric contribution to a major GO-Science, BIS and HM Treasury evaluation of UK Government support for innovation which, for the first time, showed unequivocally the significant impact on key performance indicators for UK companies due to participation in innovation programmes supported by Government.

Training and development: to identify a pipeline of talent and create meaningful interventions which guide, develop and motivate individuals through their careers within a clear and transparent framework.

Action	2014 Achievements	2015 Plans	Five Year Aspiration
Staff engagement	Launched NPL branded survey with 82% return and 54% engagement score	Proactively respond to actions highlighted by the annual staff survey; review engagement strategy and review organisational values	Become an employer of choice, as measured through an external survey such as Times Top 100 Companies
Enabled workforce	Launched MyView to include electronic leave booking and access to employee information with continuing opportunities to refine user experience	Effect a change programme to deliver self-service across core information, enabling ownership and access to intelligence	Establish a system in use by all managers, automating the employment lifecycle from recruitment through to training, performance management and a flexible benefits programme
Recruitment and talent management	Recruited 110+ staff and extended talent mapping across the whole organisation with views on talent and succession validated at all levels	Continue to recruit 'stars' and create a strategy for a flexible workforce with development opportunities both internally and externally	Annual benchmarking exercise to highlight world leading scientists at NPL, talent and succession plans in place and a continued increase in recruitment, resulting in an additional 200 staff
Training and development	Second intake of apprentices joined, 205 staff took training courses and 120 in engaged in the mentoring scheme. Recruited a full-time Learning and Development specialist to provide greater focus in this area in 2015	Coordinate a new and exciting approach to employee development that leverages our current training efforts and delivers a refined suite of support mechanisms with the aim to increase employee motivation significantly	Create the ultimate employee development experience and run an integrated approach to development with clear and transparent career paths across the organisation

Operations

NPL's closer relationship with Government and the introduction of new initiatives through the Strategic Partnership will have a significant impact on NPL's systems and processes. From managing hundreds of additional students to implementing a new governance regime, there is a great opportunity to review and adjust/renew how we operate. The next year will therefore see significant effort being spent on this activity. We will review the core structure of our business and then reflect any changes in our reporting and monitoring mechanisms, including our management information systems. We will need to implement new systems and processes, to reflect our new relationships and commitments, which balance simplicity, transparency and accountability.

We have identified three key action areas to address:

Management Information Systems: Establish a system that delivers timely, connected and reliable information. We will review and develop our management information systems in particular focused on Finance, HR and the underlying operating system Oracle. We will also need to address the management information requirements of our role in managing the estate (see next section).

Project Management: A core capability is project management and we will establish specialised PMO units across the business to professionalise the delivery and create a community of good practice.

Structuring our business to support growth of our Commercial Business: Review structures, frameworks and business processes to support commercial operations alongside our core NMI and long-term research activities.

NPL continually manages monitors and assess all aspects of health, safety and welfare to ensure staff are provided with the best possible levels of service in this ever-changing research-led environment. In 2014 NPL passed a landmark two million hours without a reportable incident and NPL won Highly Commended in the Research & Development Sector award in the RoSPA Occupational Health and Safety Awards 2014.

NPL has a broad range and extensive reach in public engagement activity, accounting for over 50% of all career events and 64% of all workshops in schools delivered by physics institutions and academic departments.

NPL successfully established Project Management Offices in each of the science divisions to support its operations. These have professionalised an essential capability, dealing efficiently with reporting and management requirements, in particular of Government and large funding organisations such as the EU, and provided another career route for scientists with interest in management demonstrated by the promotion of two scientists via the Project Management Officers to Group Leader roles. There is a plan is to roll out PMOs into other parts of NPL and also to create true community of good practice.

Action	2014 Achievements	2015 Plans	Five Year Aspiration
Management information systems	Engaged extensively with the business to work towards improving monthly financial and project reporting mechanisms	Understand new operating requirements and develop the specification to deliver new system, including a full review of NMS requirements in the new GovCo	To have management information systems in place that allow every member of staff appropriate and useable access to consistent data and reduced manager overhead
Project Management	Continued with staff training programme and developed improved tools, including financial and resource management	Establish a community of good practice across NPL with champions, tools and a common framework	To have an integrated and embedded approach to project management with supporting tools and processes that enable us to deliver more projects to specification, time and budget as indicated through customer satisfaction
Structures to deliver growth	Review of Group Leader role with the aim of reducing complexity and size without compromising on accountability	Implemented Group Leader role recommendations, review of overall structure of laboratory science to best meet new science and commercial opportunities and new NMS arrangements	To have a successful and proven structure and business model which ensures it is agile and can respond to changing demands quickly, as measured by sustainability of the business and the staff survey
Governance	Look for processes and systems that support governance to ensure these will support the new business and particularly influence the design of the QMI, with energy efficiency in mind	As part of the review, move to the new arrangements for NPL, including core governance NMS, corporate assurance and estates	To maintain our excellent track record and culture within the changing business environment of increasing projects, customers, people and facilities measured through our metrics and external awards

Estates and Infrastructure

Investing in NPL's infrastructure is critical to retain our reputation as a world-leading laboratory and to enable our staff to deliver impact. Moving to Government ownership allows for synergies in the management of estates that will be realised in 2015. Central to this is the transfer of responsibility for estates management to NPL, including both the development of the estates strategy and management of the facilities management contract. Details are currently being finalised to determine exact responsibilities, accountabilities and budgets. However, overall, much more effective delivery of estates services is expected.

Developments to manage the expected expansion of activity on the Teddington campus include substantial modification to existing space to accommodate additional NPL staff and the development of facilities for the PGI with the Strategic Partners, the Universities of Strathclyde and Surrey, which will house up to a further 200 students and staff. In addition, planning is under way to ensure the effective support of regional activities and research collaborations.

The focus of our infrastructure strategy is to deliver the following:

AQML: Build the new Advanced Quantum Metrology Laboratory (AQML) to house the core of the Quantum Metrology Institute (QMI) and provide a facility that will enable frontier research in the field.

Major facilities: Encourage new significant science facilities by attracting investment from Government and other stakeholders in areas such as environmental measurement and medical physics.

Site development: Maintain and refurbish existing NPL buildings and facilities to ensure fitness for purpose, including, in particular, improved IT and building management services.

The NPL has been officially declared the birthplace of atomic timekeeping by the European Physical Society (EPS). The announcement was made during a dedicated event at NPL in Teddington on 31 January 2014 and a plaque commemorating the historic occasion was unveiled.

NPL's new Building Management System has enabled significantly enhanced environmental control: temperature control of ±0.05°C is now being achieved in laboratories where the previous best performance was ±1.00°C; similarly, humidity has been controlled overall from ±10%RH to ±5% in many cases.

Action	2014 Achievements	2015 Plans	Five year Aspiration
Advanced Metrology Laboratories	Design work began on a new Advanced Quantum Metrology Laboratory (AQML)	Completion of design work; appointment of builder and commencement of construction work on the AQML	AQML operational; agreement of funding for and start of work on the next generation Advanced Metrology Laboratory (AML)
Major facilities	New DIAL completed to conduct emissions monitoring at industrial sites; start of work on Darwin Building refurbishment	Completion of Darwin Building refurbishment; phase 1 of a new Postgraduate Institute (PGI) completed	Delivery of various new science facilities on the Teddington site with a total value of £40M plus, PGI fully operational
Site development	Completion of Building Management System; upgrade and completion of electrical testing and review; upgrade of data centre resilience; office desktop refresh; expansion and upgrade of IT storage and backup facilities	Completion of FM retender; start of work to replace site wide alarm systems; completion of planning for Module 8 refurbishment; refurbishment of office accommodation; start of ICT transformation programme to provide collaborative, web enabled and device-agnostic IT and communications services, including IP telephony and on-site Wi-Fi in laboratories	The Teddington campus housing a significantly increased scientific population and is considered the premier location for science interface with academia and industry; appropriate accommodation established for Regional Hubs and JRCs and a flexible ICT infrastructure in place to support a mobile enabled, multi-site workforce

Financial Summary

NPL has been operating as a commercial organisation for the last 20 years with an enviable track record of delivering on average more than 10% growth in revenue year on year from competitively-won contracts. The new BIS ownership model and the wider Partnership offer significant opportunities to enhance the reach and impact of measurement as reflected in our projections.

- Overall our Revenue is forecast to grow from £79.9M in 2014 to £122M by 2019, leveraging revenue earned from government from 69% to 127%. This is in accordance with the ambitions for the new model, expanding the metrology capability in Teddington site and growing NPL's regional impact.
- The plan generates earnings before interest and tax (EBIT) during the five-year year period, rising from £6.2M in 2014 (unaudited) to £11.4M in 2019. These projections are built on our business model, benefiting from agility and appropriate freedoms to operate. All costs are planned to be recovered on a full economic basis.
- The plan is based on a robust analysis of our capabilities, customer requirements and market and technology trends and has been conservatively weighted to reflect a prudent plan for the laboratory delivering a £122M business by 2019. Once the Partnership Agreement with the Universities of Strathclyde and Surrey has been finalised, it is hoped to exceed these objectives as the benefits arising from the Partnership can then be fully incorporated into our financial plans.
- Capital expenditure of £47.3M is required for the delivery of the plan across the five-year period to buy equipment for the delivery of the NMI mission. This is funded by loans. Revenue.

NPL's overall revenue growth is based on the following revenue streams:

NMS revenue:	The NMS Programme Revenue consists of revenue earned from BIS and is used to develop the capabilities and assets to deliver the NMS.
Measurement Services	Measurement Services includes the provision of traceable calibrations to calibration houses and individual companies that require specialist measurement services (e.g. large scale industrial manufacturers).
Technical R&D Grant	A number of sources fall into this category, e.g. EMRP/EMPIR, UK grant competitions (e.g. Innovate UK, NIHR) and other European R&D grant competitions (e.g. FP7/Horizon 2020).
Technical Services	NPL delivers a range of broader technical services including Technical R&D for companies, Knowledge Transfer, Training, Instrumentation and IP exploitation.
Collaboration activities	Revenue generated through the wider and deeper collaborations include expanded regional hubs, an acceleration and expansion in international research and instrumentation, as well as improved IP exploitation. The new model will see NPL collaborate increasingly with its strategic university partners in supporting industry.

Summary Income Statement

£k	2014 (Draft)	2015	2016	2017	2018	2019
Total Revenue	79,892	87,638	95,641	104,152	111,780	122,277
Direct Costs	39,999	41,525	44,805	49,375	52,736	58,450
Indirect Costs	29,464	39,856	41,373	42,553	43,882	45,517
EBIT	6,197	2,473	5,101	6,956	8,843	11,396
PBT	5,776	-22,324*	3,215	5,104	7,011	9,434

* Includes exceptional item associated with pension liabilities of £22.8M

Hampton Road
Teddington
Middlesex
TW11 0LW

Switchboard 020 8977 3222
www.npl.co.uk